(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number : **0 598 601 A1**

(12) EUROPEAN PATENT APPLICATION

(21) Application number : **93309156.3**

(22) Date of filing : **17.11.93**

(51) Int. Cl.[5] : **B63C 9/19**, B63C 9/22

(30) Priority : **18.11.92 GB 9224184**

(43) Date of publication of application :
25.05.94 Bulletin 94/21

(84) Designated Contracting States :
DE FR GB

(71) Applicant : **C.M. HAMMAR HANDELS AB**
August Barks Gate 15
S-421 22 Västra Frölunda, Gothenburg (SE)

(72) Inventor : **Gordon, Peter Cronin**
10 Hollytree Road
Liverpool, L25 5PA Merseyside (GB)

(74) Representative : **Denmark, James**
Bailey, Walsh & Co.
5 York Place
Leeds LS1 2SD Yorkshire (GB)

(54) Automatic activator.

(57) The invention comprises a trigger mechanism for use in marine applications for example to control the release of liferafts from ships, or for controlling the inflation of liferafts and life jackets. The mechanism is two stage in operation in that a first sense and respond device must be operated before a second sense and respond device is operated, and the second sense and response device is of the moisture or water presence controlled type. The first sense and response device is of such a nature to prevent water from reaching the second sense and response device until the first device is triggered. Specifically, the first device includes a membrane which is ruptured when subjected to water pressure so that the water can flow through the ruptured membrane and actuate the second device. Thus, if the mechanism is part of something which falls or is thrown into the sea, the pressure of the sea water deflects and causes rupture of the membrane and the sea water flows through the membrane and actuates the second device and the liferaft is released or the jacket or raft is inflated automatically as the case may be.

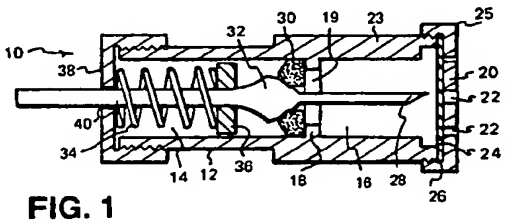

FIG. 1

EP 0 598 601 A1

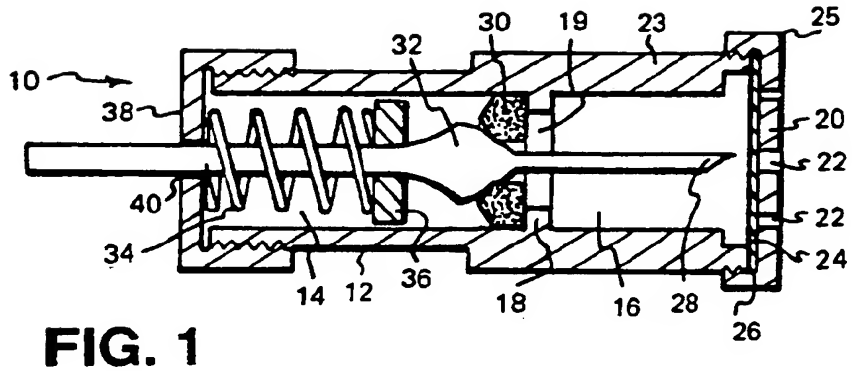

FIG. 1

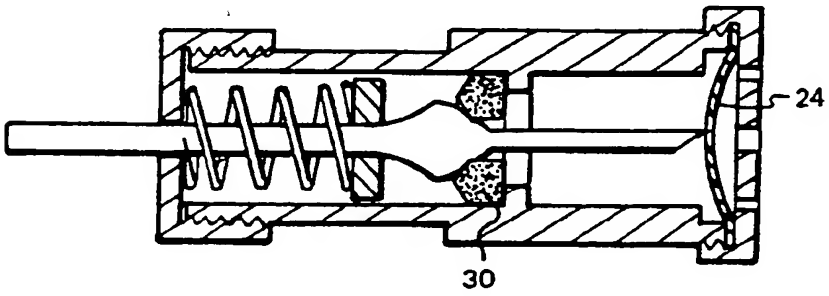

FIG. 2

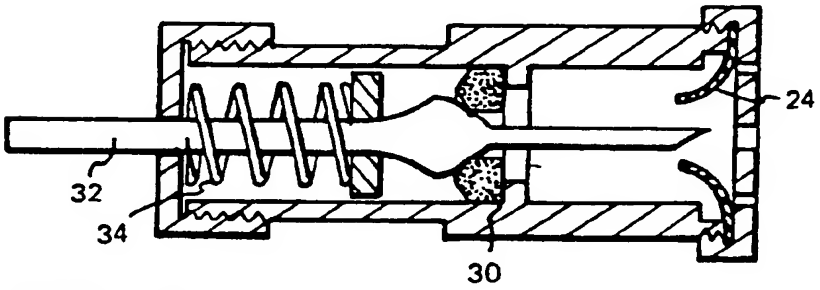

FIG. 3

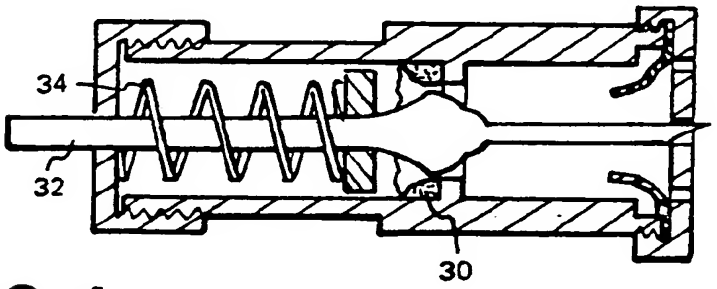

FIG. 4

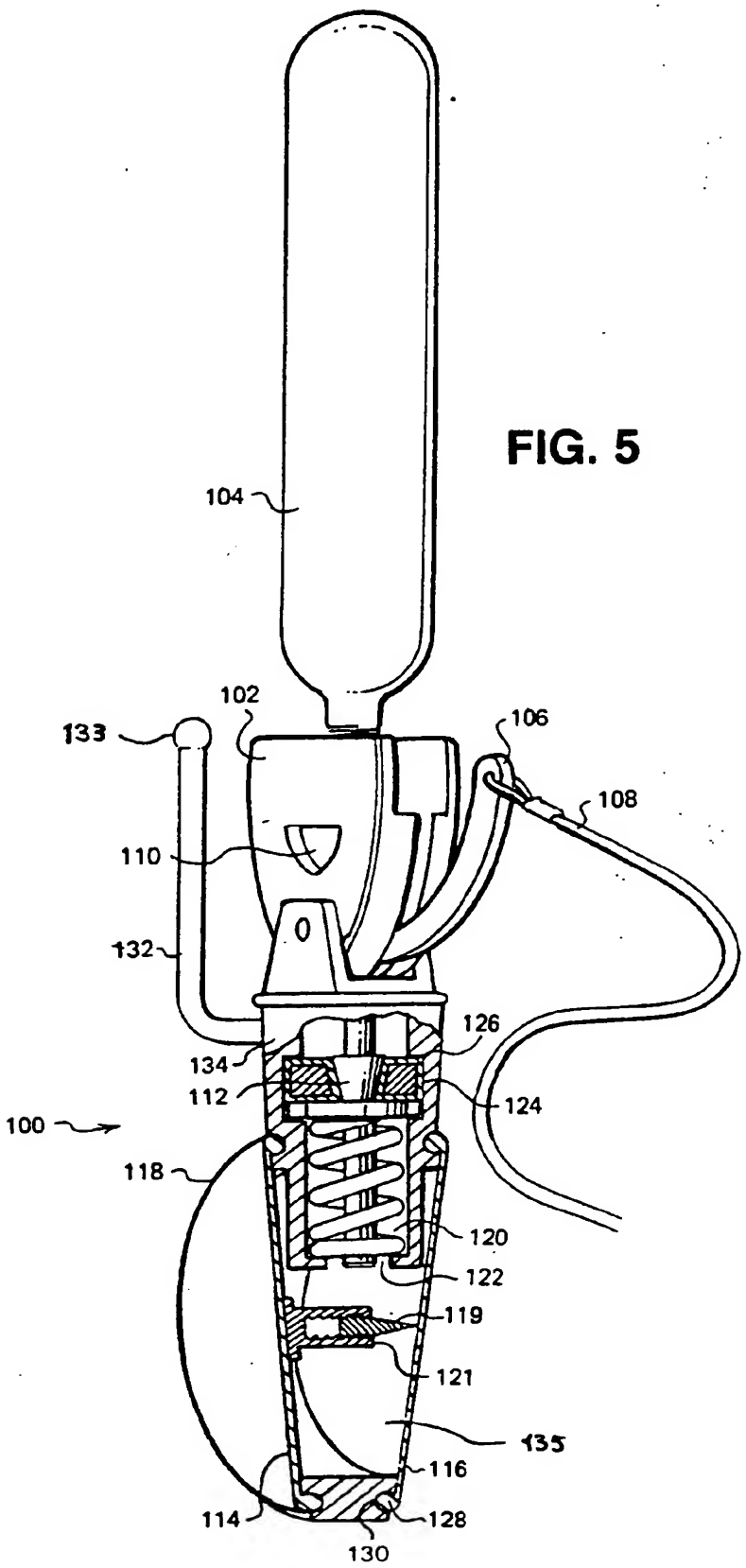

FIG. 5

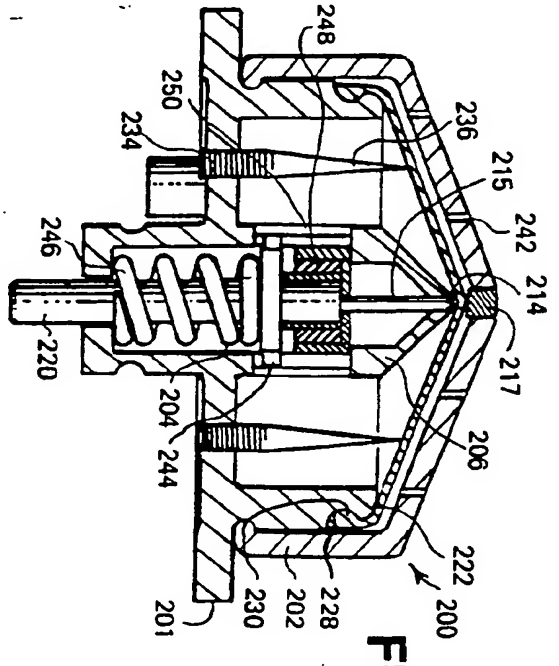

FIG. 8

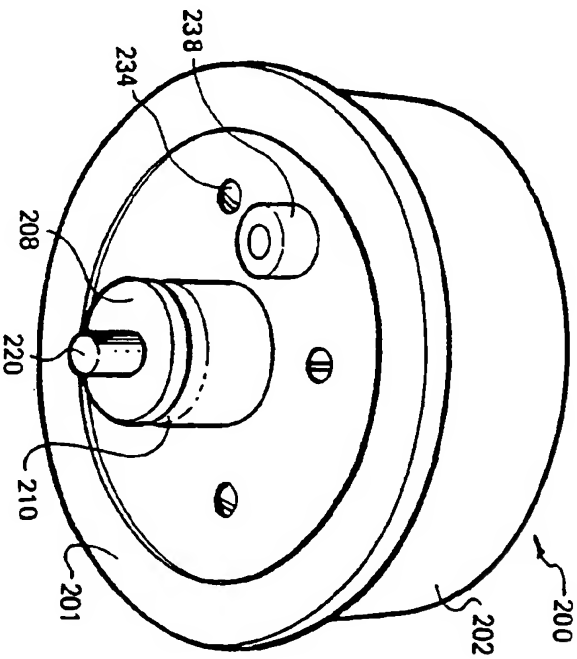

FIG. 6

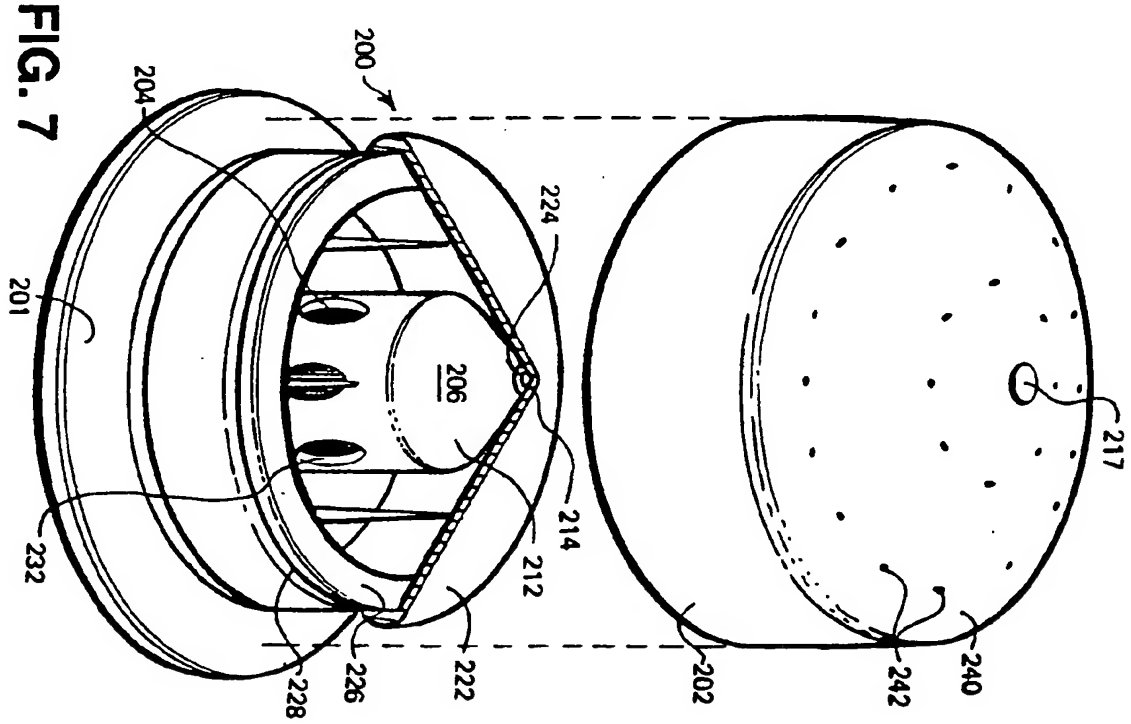

FIG. 7

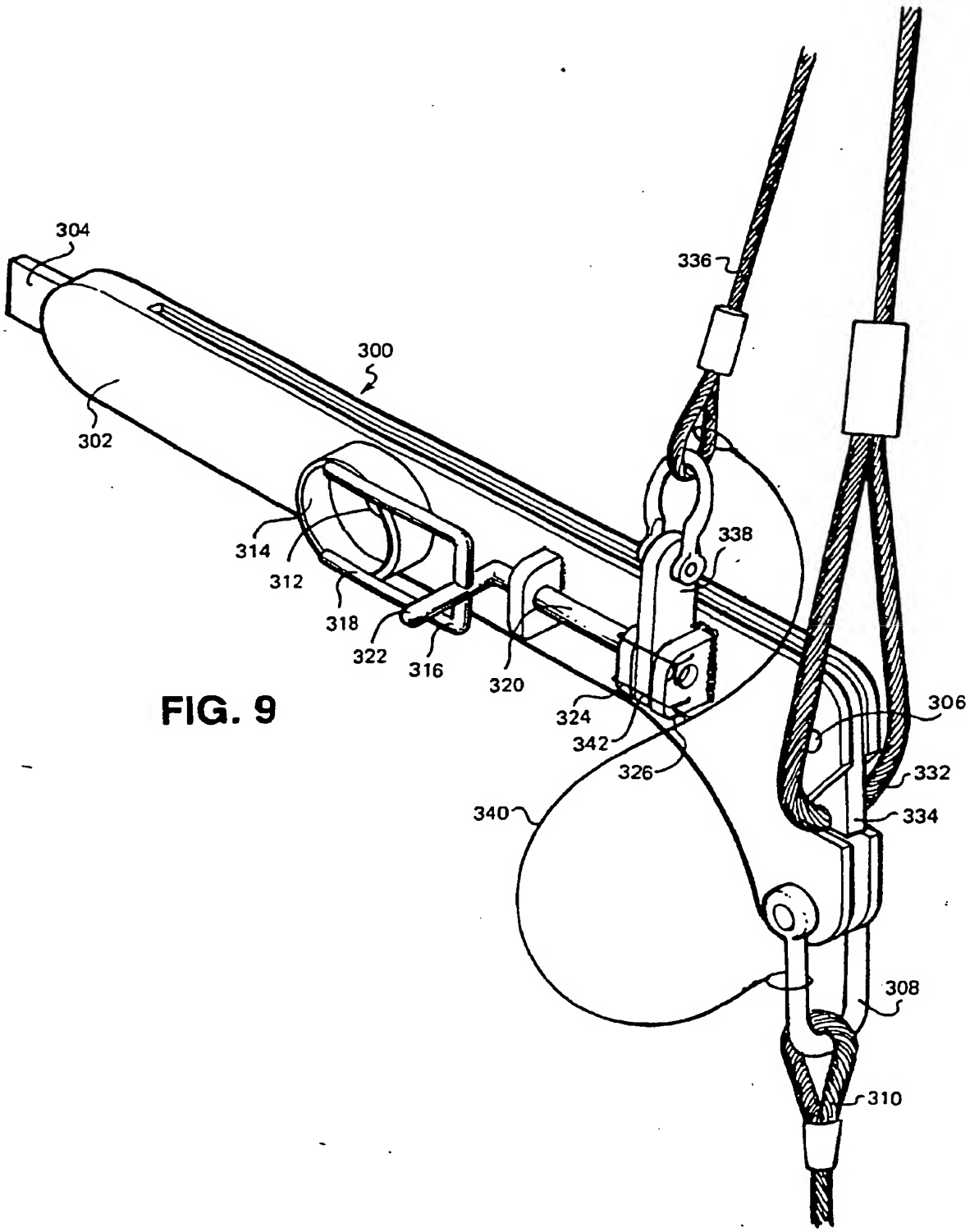

FIG. 9

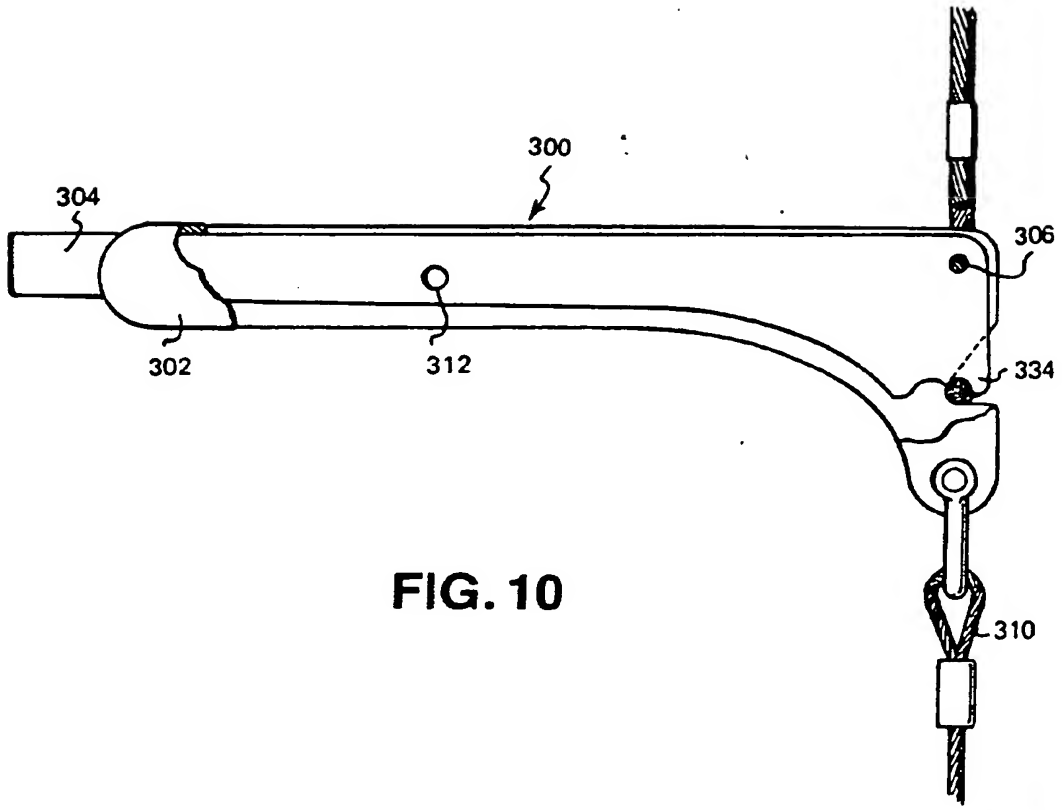

FIG. 10

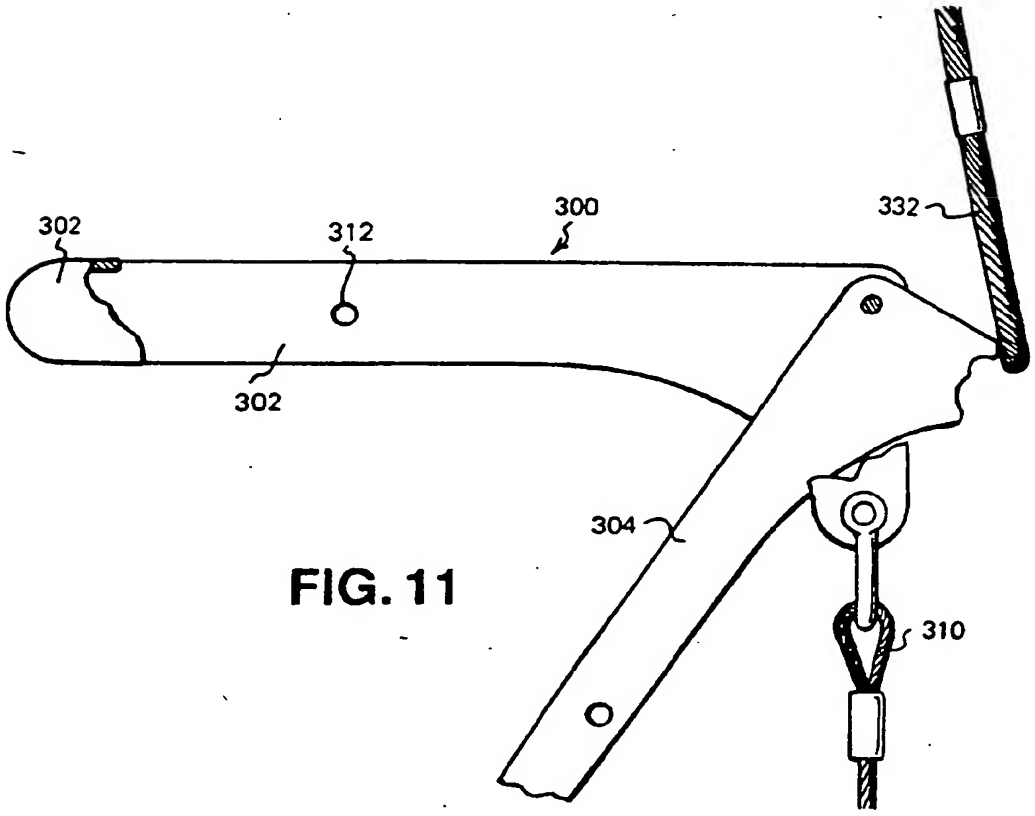

FIG. 11

The present invention relates to automatic activators associated with an aquatic environment.

There are various products available in the marine safety industry which are automatically actuated in response to a change in environmental conditions. The most common forms of activator are those which release a device at specific depths under water. These activators are designed to, for example, release closure devices on water tight doors, release distress beacons or radar transponders from specific depths, as well as to release liferafts from manual release units such as senhouse slips.

Such devices have historically worked on the principle of hydrostatic pressure moving or exerting pressure on a membrane normally supported by a spring.

The most common use of the hydrostatic release unit is to be found on inflatable liferafts, which are packed tightly in containers and which are then installed on ships ready for use in emergencies. Such liferafts in the event of the ship getting into difficulty would be "thrown" overboard (these are called throw over liferafts) and on pulling a rope (painter) will inflate. The passengers then climb down ladders or jump into the liferafts or travel down marine escape systems ("MES"). Alternatively, liferafts can be davit launched. Here the liferafts are inflated at deck level, boarded with passengers and lowered onto the water. However, in both types of liferaft, the liferaft containers when stowed on deck are stowed on cradles and held down by a manual senhouse slip or senhouse release unit as well as an automatic hydrostatic release unit. This means that if the liferafts are thrown over or davit launched before the ship sinks then this is done manually using the senhouse slip. On the other-hand, however, if the passengers or crew are not able to get to the liferaft before the ship starts to sink, and if the ship sinks without having released the liferaft, once the liferaft container which is held down on its cradle on the deck reaches a depth of between one and a half to four metres the hydrostatic release unit automatically releases it.

The principle of hydrostatic releases has generally been based on the use of a spring supporting a diaphragm and the diaphragm moving when it comes under pressure of water.

GB 2051212, for example, describes a hydrostatic release unit which has a sealed chamber with a diaphragm which is urged by water-pressure to release a cam thereby releasing, for example, a liferaft. It operates automatically when a ship sinks, releasing the lashings of the liferafts stowage at a predetermined depth. The unit is usually installed as part of a liferaft stowage lashing system and is fitted between the deck and a senhouse slip.

Another type of device is described in EP 198805. The securing arrangement of this device is so executed to be tripped on actuation for the purpose of changing the state of or enabling a change in the state of an attached item of equipment, which is so arranged by means of a loadable link to hold the equipment in a securing position. This device uses a piece of nylon rope to carry the load, which is cut by a knife driven by a powerful spring. The hydrostatic membrane is attached to a release pin which holds the knife back and as soon as the release unit reaches a certain depth, water pressure acting on top of the membrane pushes the membrane down, against the pressure of the hydrostatic membrane spring, into the air chamber and this then pulls the pin that is attached to it. The pin which holds the knife flies forward under the load of the spring and cuts the rope.

This device has been modified for smaller items such as radio distress beacons by replacing the nylon rope with a nylon plastics bolt.

Both units are, however, designed for generally larger objects, i.e. objects which will displace a substantial amount of water. They are not ideally suited for lighter weight devices such as distress beacons, since they are expensive and are over engineered for smaller uses.

Another type of device and one associated with the inflation of lifejackets is described in US 4498605 and EP 236599. Such water activated releases operate by water dissolving a bobbin of salt or compressed paper. A salt bobbin or compressed paper bobbin holds back a spring loaded pin which, when the bobbin is immersed in water, dissolves or collapses allowing the spring loaded pin to travel forward and pierce the end of a compressed gas cylinder, thereby allowing the gas, normally carbon dioxide, to rush into the lifejacket and inflate it.

Such devices suffer from the disadvantage that in humid conditions, rain, spray or the like they may be accidentally set off. As a result, the application of such devices is limited.

It is one object of the present invention to provide an actuation device which is more versatile than the aforementioned devices.

According to one aspect of the present invention there is provided an actuation device comprising: sequentially operating sense and respond means comprising a first sense and respond means which is operable in response to a change in hydrostiatic pressure, and

a second sense and respond means which is operable in response to a change in moisture or liquid content.

The provision of two sense and respond means, gives rise to an actuation device with advantages over the respective hydrostatic units and water actuated units of the prior art.

Compared to the water activated units of the art, a device according to the invention has the advantage that it is not likely to go off accidentally in humid and damp conditions, rain, spray etc.

Compared to the hydrostatic units, a device according to the invention can be simpler, lighter, smaller, work at shallower depths (more sensitive) and be cheaper to produce than the hydrostatic units of the art.

According to a further aspect of the present invention there is provided an automatic actuator for actuating a device, the actuator comprising a housing; an actuator member mounted, at least in part within the housing, the actuator member being movable from a first position to an actuated position; a fluid actuated trigger assembly for preventing the actuator member from moving from the first position to the actuated position until triggering of the trigger assembly by exposure to a fluid; characterised in that the actuator further comprises means which must be activated before the fluid activated trigger assembly can be actuated.

Preferably, the means is a hydrostatically activated trigger assembly.

In one embodiment the hydrostatically activated trigger can be bypassed by pumping a fluid into the device in order to achieve manual release from a local or distant position.

The provision of means preventing actuation of a fluid activated trigger assembly until a given hydrostatic pressure is experienced gives rise to a device with greater versatility than the devices of the prior art.

In one embodiment, the means preventing actuation of a water activated trigger assembly until a given hydrostatic pressure is embodied in a membrane which is displaced under pressure to allow the device to be actuated.

In another, and more advantageous, embodiment the membrane is constructed to either puncture or burst. By puncturing or bursting the membrane the disadvantage of "partial fill" is alleviated. "Partial fill" is the state where some water enters the device, but the amount entering is insufficient to cause triggering of the fluid actuated trigger at the time but later can cause inadvertent actuation. This may prevail where, for example, a hydrostatic pressure sufficient to allow triggering of the device is reached momentarily but is not sustained for long enough to allow enough water to enter the device to trigger it.

One problem encountered in providing a membrane which is triggered by water pressure changes is that air pressure fluctuations can result in accidental trigger.

In a further embodiment, the device can therefore be provided with a pressure compensator or "breather", if necessary.

Some specific embodiments will now be described, by way of example only, with reference to the following drawings in which:

Figs. 1 to 4 show in cross-section a simple device and its operation in schematic form;

Fig. 5 is a perspective view in part cross-section of a device adapted as an actuating device for inflating a lifejacket;

Fig. 6 is a perspective view from below of a device adapted as an actuating device for releasing a liferaft or like object;

Fig. 7 is a perspective view from above, in part cross-section, the top being shown displaced from the base of the device of Fig. 6;

Fig. 8 is a cross-sectional view showing the actuation mechanism of the device shown in Figs. 6 and 7.

Fig. 9 is a perspective view of a lever assembly used in conjunction with the device illustrated in Figs. 6 to 8; and

Figs. 10 and 11 show the lever assembly of Fig. 9 in various stages of operation.

Fig. 1 illustrates a simple actuation device according to the invention and in conjunction with Figs. 2, 3 and 4 demonstrates the operative principle behind the invention. The actuation device 10 comprises a generally elongate cylindrical plastics casing 12 comprising two interconnecting chambers 14 and 16 which chambers are separated by a shoulder 18 and central bore 19.

One end 20 of the casing 12 comprises a series of channels or pores 22 which communicate with the outside. This end is connected to the main body 23 by a screw thread arrangement 25, thereby allowing a membrane 24 to be fitted and/or replaced. Membrane 24 is held tightly across pores 22 preventing communication between the chamber 16 and the outside. The membrane 24, which is made of a resilient or elastic material such as rubber is stretched over the pores 22 so that water is unable to enter the chamber 16 and is retained by retaining means 26 which are provided in the casing. These may take the form of grooves into which a thickened edge of the membrane can be received.

Whilst the membrane could be arranged so that under pressure it is displaced from retaining means 26, thereby letting water into the chamber, the preferred embodiments illustrated have a membrane bursting or puncturing means 28 provided. This membrane bursting or puncturing means is in the form of a pin, which pin is spaced a given distance from the membrane. By adjusting the membrane type and or the distance of the pin from the membrane, the device can be adjusted to burst or puncture under specific pressures.

Supported within the second chamber 14 on shoulder 18 there is a water soluble pellet 30 which is housed in a bobbin (not shown). The pellet may, for example, comprise a salt or a compressed paper pellet. The pellet supports a member 32 which is retained in a first position despite the fact that a compressed spring 34 (Figs. 1, 2 and 3) is urging it towards end 20. A pellet guide plate 36 disposed to-

wards the other end 38 of the casing helps guide the member 32 on actuation. The other end 38 is also screw threadedly attached to the main casing 12, thereby allowing the pellet 30 to be periodically replaced. A water tight seal is provided between an aperture 40 in the end plate 38 and the member 32, and it is through this aperture that member 32 is retracted on actuation. On actuation, member 32 slides from its first position (Figs. 1 to 3) to a second position (Fig. 4). In doing so, the movement of the member 32 can be utilised to release or lock another device or actuate a further mechanism.

The operation of the device can be more clearly explained with reference to Figs. 1 - 4 which show in sequence how the device of Fig. 1 operates.

Fig. 1 shows the device when it is out of water. Membrane 24 prevents the access of water into the chamber 16 and consequently the tablet 30 cannot dissolve. Since the chamber is substantially sealed from the outise, the device will not go off in, for example, humid conditions or in the rain.

Referring now to Fig. 2, if the device is subjected to pressure, for example, hydrostatic pressure by immersing it in water, as would happen when a ship sinks or a man wearing a lifejacket with such a device went overboard, the membrane 24 is subjected to pressure and bows as illustrated.

When the pressure reaches a preset level, the membrane 24 will be displaced, or burst as illustrated in Fig. 3.

Water is then able to act upon the tablet 30, which dissolves to an extent whereupon it can no longer retain member 32 in its preset position. The spring 34 then forces the member 32 forward from its preset or first position to a second position and "fired" position. This movement of member 32 is utilised to, for example, release or lock something or instigate the operation of another mechanism.

The principle of the invention is further described as illustrated with reference to the specific embodiments shown in Figs. 5 to 8.

Fig. 5 illustrates a device for inflating a lifejacket. It may be operated manually, or, where a wearer of a jacket utilising such a device falls overboard into water, automatically.

Additionally, the device can be fitted with a mechanism that prevents the automatic version working. For example, by arranging for the cover of the device to be rotatable, the cover can be turned so that access holes for the water are covered, whereby the device can then only be operated manually by the wearer. This is useful if, for example, the wearer is working on the deck of a vessel where it would be set to AUTOMATIC - this being vital if perhaps he falls into the water after being knocked unconcious. However, he may need to go ashore in a small dinghy where he might enter the water when he "beaches" or lands the boat. In this case he does not want an automatic device - he only wants a device which can be operated manually. This therefore overcomes the problem of the necessity to "switch off" the automatic facility.

The automatic actuator device 100 comprises a mechanism similar in many respects to the one described in EP 236599. It comprises an internally threaded insert 102 molded within a body. The insert is designed to threadably receive a cartridge 104 containing compressed gas such as carbon dioxide. A piercing pin (not shown) is reciprocatingly positioned within the body in alignment with a frangible seal of the cartridge. The passageway containing the reciprocating piercing pin is connected in fluid communication with a manifold which is, in turn, connected in fluid communication with the inflatable device to be inflated. A manual lever 106 is pivotably connected in alignment with the piercing pin in such a manner that movement of the cord 108 of the lever causes a cammed end (not shown) of the lever 106 to engage the piercing pin and force the piercing pin toward the cartridge 104. Further movement of the cord 108 eventually causes the piercing pin to fracture the seal of the cartridge 104 thereby releasing the compressed gas contained therein and permitting the same to flow into the inflatable article via passageway 110. A lanyard may be connected to the cord 108 to facilitate operation of the lever 106.

The automatic actuator of the invention has an alternative means for operating the assembly described above. An intermediate transfer pin 112 reciprocally positioned in axial alignment with the piercing pin of the inflator is during use actuated automatically. The features of the device are, however, described with reference to its use.

On entering the water, the automatic actuator 100 is submitted to a hydrostatic pressure. Two membranes 114 and 116 which are supported on a frame 118 and are separated by an air space 135 move inwards, in response to the pressure exerted. The thicker membrane 114, to which a pin 119 or like member is fitted via an adjustable mechanism 121, moves toward the thinner membrane 116 and vice versa. The air under pressure in the space 135 between the membranes is moved up the tube (132) and expands the flexible diaphragm 133 by virtue of the fact that the diaphragm 133 is at a shallower depth and therefore at a lower pressure. When the pressure is such that the membrane 116 meets the pin 119, the thinner membrane bursts allowing water into the chamber 120 via aperture 122. The membranes are protected by covers with holes in, to prevent damage or inadvertent inflation by finger pressure etc.

The use of the tube 132 and diaphragm 133 is not necesary, even although they make the device more sensitive to pressure changes. If the tube and diaphragm are omitted the device still functions satis-

factorily but may require to be submerged to a greater extent to cause sufficient deflection of the membranes to cause the rupturing of the membrane 116.

In this connection, to improve the rupturing effect, the device 121 may be supported on a leg or spider member, and may be provided with two oppositely facing spikes 119 which puncture the respective diaphragms as they are displaced inwardly under the influence of the water pressure. Thus ensures adequate flooding of space 133 and displacement of the air therefrom.

The water is then able to dissolve the salt tablet 124 which is held in bobbin 126. Upon disintegration of the tablet, the actuator member 112 is permitted to move forward from a first position, in which it was retained by the tablet to a second and actuated position in which the actuator member 112 contacts an intermediate actuator pin (not shown) which in turn contacts a piercing pin causing the seal in the cartridge to be pierced and the lifejacket to inflate in the same way that pulling lever 106 would operate the device manually.

Looking more closely at the device, particular note should be made of the following features:

1. The use of a plurality, preferably two membranes, cooperating together enables greater sensitivity to be achieved. Thus, the device can be adapted for use at depths of, for example, as little as 10 cm.
2. The provision of a tube 132, the end of which carries a flexible device or diaphragm 133, allows the air under pressure in chamber 135 to expand into a chamber at a lesser pressure because it is nearer the water surface.
3. The use of membranes of differing thicknesses and materials fitted with different tensions enables accurate control of the trigger depth to be achieved.
4. The provision of a membrane piercing member whose position relative to a membrane can be adjusted further aids accurate control of the trigger depth.
5. The provision of membranes with thickened edges 128 which edges are accommodated in grooves 130 in the housing makes assembly easy, and
6. The provision of a tube 132 opening into the chamber where the tablet is situated allows any air to escape from the vacinity of the tablet when the device is actuated.

This point is particularly important where the device is used in association with a lifejacket since the device is orientated in a jacket such that the wearer will float substantially vertically in the water. Since the tablet 124 is at the upper end 134 of the device, there is a danger that air will be trapped about the tablet, preventing actuation unless an outlet for air is provided.

7. Provision by a single, simple action that does not require the lifejacket to be unpacked or the mechanism to be removed, for converting the device from automatic to manual operation, and vice versa.

In another embodiment of the invention, and as illustrated in Figs. 6 to 8, there is provided an automatic activator device 200 for the release of liferafts and like articles.

This comprises a plastics base member 201 over which a cover member 202 slidably fits. The base houses a water activated mechanism 204 and is so shaped to receive the mechanism. It thus comprises a lantern shaped housing 206 which is adpated at one end 208 to fit into a lever release mechanism such as a senhouse slip. The end 208 is thus provided with a groove 210. The other end 212 is conical in shape and has a small aperture 214 therein which aperture is aligned with the firing pin 215 and a "fired" indicator 217 on the cover member 202. Thus when the mechanism 204 actuates, a locking pin 220 is withdrawn from the base, knocking out the indicator 217. A membrane 222 is supported between the top 224 and the annular wall 226 of the base member 201. The outer annular wall 226 is provided with a recess 228 to receive a thickened portion 230 of the circular membrane 222, which is stretched over the top 224 of the base member 201. The housing 206 is provided with communicating holes 232 which, when the membrane 222 bursts, allow water to enter the casing so that the water activation mechanism 204 housed therein can be actuated.

This mechanism is essentially that described with reference to Fig. 1.

The base member 201 has one or more threaded holes 234 which are adapted to receive the membrane bursting means 236, which are in the form of sharpened screws. By screwing these into the device their position relative to the membrane can be controlled and hence the sensitivity of the device can be controlled.

The base is also provided with a "breather" 238, which is microporous and slowly allows air to pass therethrough but prevents ingress of water so that air pressure changes do not set off the device accidentally.

The upper surface 240 of the cover member 202 contains numerous holes 242 that allow water to exert pressure on the membrane. The cover member 202 also protects the membrane against accidentally being burst by sharp objects.

The mechanism of the device comprises an actuation member or locking pin 220 which is a suitably adapted generally elongate shaped member. Between the locking pin 220 and guide plate 244 a spring 246 is housed under compression. A tablet 248 housed in a bobbin 250, urges the locking pin 220 into a "locked" position. When the membrane 222 bursts,

water enters the mechanism and the tablet 246 dissolves, thereby allowing the locking pin 220 to move a distance equivalent to that occupied by the tablet 248 as the spring 246 unloads. As the locking pin 220 moves forward, its end which previously locked into a lever (not shown), releases, for example, the webbing holding a liferaft to a cradle. This procedure is shown in more detail with reference to Figs. 9 to 11.

A lever arrangement 300 comprises a first lever member 302, and a second lever member 304 which members are pivoted at position 306. A shackle 308 is connected to a deck plate, not shown, by a wire 310. Passing through both members 302/304 is a hole 212 into which the locking pin 220 of the device illustrated in Figs. 6 to 9 fits. A housing 314 is provided to simplify the positioning of actuating device 200 into the lever arrangement. The actuating device 200 is locked into position by means of a locking lever 316, having forks 318 which lock into the recesses 210 of the actuating device. The locking lever is also provided with a runner 320, and a handle 322. The runner 320 runs between two members 324 and 326, which members are provided with apertures through which the runner 320 can run.

When a boat sinks and the device is triggered, the locking pin 220 of the actuating device is withdrawn, allowing member 304 to move in the direction of the arrow and thereby allowing the shackle 332 to be released from retainer 334, and allowing the liferaft (or other device) to float free from its cradle. Line 336, the painter line, which is attached to the liferaft at one end, and the lever at the other end via member 338, is attached to the lever by a weak link 340 and a further weak link 342 which runs between members 324, 326 and 338. When a boat sinks, the painter line is fed out until the pressure is such that first weak link 340 and then weak link 342 break under the force of the sinking boat.

To manually release the liferaft, the lever 316 is slid across from left to right, freeing the device 200 from its housing 314. Device 200 can then be pulled out, allowing jaw 334 to open, and releasing the liferaft securing line as shackle 332 is released. At the same time the runner 320 passes through the aperture of member 324, 326 and 328, securing the painter line to the device. The liferaft can then be launched (but not lost as it is held close to the ship until such time as it is released by the crew).

When the device is fitted, it does not require a separate "conventional" senhouse release to be fitted additionally as the device also carries the function of this release.

The hydrostatic release device can equally well be fitted to a more simple lever device that does not incorporate a manual release. In other words, it can consist only of parts 300, 302, 304, 306, 308. Part 200 is fitted permanently to part 302. Parts 314, 316, 318, 320, 322 through to 342 are not required. The manual release facility is then provided by a "conventional" senhouse release mechanism which is separate but connected to the device of this invention, above or below this device.

It will be understood from the foregoing specific embodiments that the principle embodied by the respective devices can be applied to produce other devices for similar uses. For example, the lifejacket embodiment can equally be used for the liferaft version and vice versa.

It is recognised that any of the features exemplified in each of the drawings may if appropriate be combined and claimed in combination as inventive combinations even although not claimed specifically as such in the accompanying claims.

Claims

1. An actuation device comprising acquentially operable
   a) first sense and respond means; and
   b) second sense and respond means,
   characterised in that said second sense and respond means is operable in response to a change in moisture or liquid presence.

2. A device according to Claim 1, wherein said first sense and respond means comprises a means which is operable in response to hydrostatic pressure.

3. A device according to Claim 2, wherein said sense and respond means includes a rupturable membrane displaceable by hydrostatic pressure.

4. A device according to claim 3, wherein said rupturable membrane at least partially encloses a chamber containing a rupturing means which ruptures the membrane when displaced by hydrostatic pressure, to allow water to enter the chamber, and said second sense and respond means is arranged in relation to said chamber such that any water which enters the chamber contacts said sense and respond means to cause operation of same.

5. A device according to Claim 4, including a protective cover member which covers said membrane to prevent accidental displacement of the membrane, said cover having opertures therein to allow water therethrough to apply hydrostatic pressure to the membrane.

6. A device according to Claim 5, wherein there is a displaceable closure member operable selectively to cover or uncover said apertures so as to render the first sense and respond means selective-

ly operable as well.

7. A device according to Claim 4, wherein said chamber has a breather tube connected thereto, and an expansion balloon connected to the end of the breather tube to enable air in the chamber readily to be displaced from the chamber into the breather tube to expand the balloon and permit rapid response deflection of the membrane in response to hydrostatic pressure.

8. A device according to claim 4 or 7, wherein the chamber includes an air flow controller through which air can pass but not water so that air pressure changes do not accidentally operate the first sense and respond means.

9. A device according to Claim 1 or 2, wherein said second sense and respond means includes a tablet, block or the like which disintegrates in the presence of water.

10. A device according to Claim 9, wherein the tablet, block or the like forms an obstruction to the movement of an actuator member which is spring loaded against the block, tablet or the like.

11. A device according to Claim 10, wherein the tablet block or the like is of salt and/or compressed paper.

12. A device according to Claim 3 or 4, wherein said second sense and respond means includes a tablet, block or the like which disintegrates in the presence of water.

13. A device according to Claim 12, wherein the tablet, block or the like forms an obstruction to the movement of an actuator member which is spring loaded against the block, tablet or the like.

14. A device according to Claim 13, wherein the tablet block or the like is of salt and/or compressed paper.

15. A device according to Claim 1, including a manually operable means adapted to perform the same function as the second sense and respond means when operated.

16. A device according to Claim 15, wherein said manually operable means comprises a pull cord and lever, and the device includes a firing pin adapted to be displaced either by said lever when the pull cord is pulled, or by said second sense and respond means when operated.

17. A device according to Claim 4, including a cylindrical housing in which said chamber is defined at one end and the membrane is at one end of the chamber, and said second sense and respond means comprises an annular member which disintigrates in the presence of water and a spring loaded actuator member having a shoulder bearing against the annular member, the actuator member including a rod which lies axially of the cylindrical housing.

18. A device according to Claim 4, wherein said chamber is defined by a ring shaped member attached to a housing, the ring shaped member being closed on one side by said membrane and being closed on the other side by a second membrane carrying on the inner face a spike which projects towards the inner face of the first membrane to replace same when the first membrane is displaced inwardly by hydrostatic pressure, said housing defining an opening leading to said chamber and said second sense and respond means comprises an annular member which disintigrates in the presence of water and a spring loaded actuator member having a shoulder bearing against the annular member, the actuator member including a rod which lies axially of the housing.

19. A device according to Claim 4, wherein said chamber is defined by a cylindrical housing and the housing comprises a base plate from which extends an upstanding circular wall to the top of which the membrane is attached, and the membrane is covered by a cap closure to protect same but is provided with pores therein to allow hydrostatic pressure to be applied thereto, the said base plate being provided with spike means to rupture the membrane when displaced under hydrostatic pressure, and the base plate further including a control sleeve housing second sense and respond means which comprises an annular member which disintigrates in the presence of water and a spring loaded actuator member having a shoulder bearing against the annular member, the actuator member including a rod which lies axially of the central sleeve.

20. A device according to Claim 1 or 2, wherein and second sense and respond means is connected to a lever mechanism for holding a liferaft to a cradle, said lever mechanism comprising two levers which are locked from relative movement (which releases the liferaft) by an actuating member operable by said second sense and respond means.

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 93 30 9156

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.5)
X	US-A-3 802 012 (W.MIDDLETON) * abstract; figures * * column 7, line 50 - column 9, line 6 *	1-3,9-16	B63C9/19 B63C9/22
X	DE-B-12 42 469 (THE WALTER KIDDE COMPANY LTD.) * column 3 - column 5; figures *	1,2,9-11	
A	DE-B-11 17 433 (P.FRANKENSTEIN) * column 4, line 26 - line 33; figures * * column 1, line 8 - line 9 *	6,11,14	
A,D	EP-A-0 198 805 (M.HERMANSSON) * column 3, line 51 - column 4, line 6 * * column 5, line 17 - line 28; figures *	7,8	
A	HIGH-SPEED SURFACE CRAFT vol. 20, no. 3 , March 1981 , LONDON pages 36 - 37 'Automatic lifesaver further developed'	20	

TECHNICAL FIELDS SEARCHED (Int.Cl.5)

B63C
B63B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	8 March 1994	Stierman, E

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)